four females and four males collected three miles northwest of Hope, Idaho in July and August of 1962–4 by R. A. Goyer and M. M. Ollieu: and eleven females and five males collected at Trestle Creek, Bonner County, Idaho on August 1 and 2, 1962 by M. M. Ollieu: all the above in association with cones of *Pinus monticola*.

Also included as paratypes are three females and five males reared from *Petrova* sp. on *Pinus contorta* collected at Medicine Lake, California by M. M. Furniss (Hopkins U. S. No. 33990B) on July 22, 1953.

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## Studies on North American Ants. I. The Formica integra Subgroup

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This study grew out of an attempt to clarify the relationship between two taxa of the *Formica rufa* group in North America: these are the forms called by Creighton (1950) *Formica integra haemorhoidalis* and *Formica obscuripes ravida*. A study of their types and additional material convinces me that they are synonymous, and that a third synonym is *Formica integra tahoensis*. The senior name to be applied to this species is *Formica haemorrhoidalis;* it appears to be distinct from *Formica integra*, to which it was formerly attached as a subspecies. Offered below are a formal synonymy embodying the necessary changes, a discussion of the evidence for the revisionary conclusions, and some remarks on the position of the two species within the *rufa-truncicola* group.

### Formica haemorrhoidalis

*Formica rufa* subsp. *integra* var. *haemorrhoidalis* Emery, 1893. Zool. Jahrb. Syst. 7: 652, worker. Type locality: Colorado, by subsequent selection of Wheeler, 1913. Lectotype, by

present selection, a major worker (appropriately labeled) from "Colorado," in Forel Collection, Muséum d'Histoire Naturelle, Geneva. A second worker, originally on lectotype pin, in Museum of Comparative Zoology at Harvard University.

*Formica truncicola* subsp. *integroides* var. *haemorrhoidalis*, Wheeler, 1913. Bull. Mus. Comp. Zool. Harv. 53: 441, worker, female, male.

*Formica integra haemorrhoidalis*, Creighton, 1950, Bull. Mus. Comp. Zool. Harv. 104: 488, discussion.

*Formica truncicola integroides* var. *ravida* Wheeler, 1913, Bull. Mus. Comp. Zool. Harv. 53: 560, worker, female. Type locality: Elkhorn, Montana. Syntype workers and alate female in Museum of Comparative Zoology at Harvard University. New synonymy.

*Formica truncicola integroides* var. *tahoensis* Wheeler, 1917, Proc. Amer. Acad. Arts Sci. 52: 538, worker, female. Type locality: Lake Tahoe, California. Syntypes in Museum of Comparative Zoology at Harvard University and elsewhere. New synonymy.

*Formica integra haemorrhoidalis*, Creighton, 1950, Bull. Mus. Comp. Zool. Harv. 104: 488.

*Formica integra tahoensis*, Creighton, 1950, *op. cit.*, p. 488.

*Formica obscuripes ravida*, Creighton, 1950, *op. cit.*, p. 493.

*Formica rufa* group, Forms B, C, and D; G. C. and J. Wheeler, 1963, The ants of North Dakota, Univ. N. Dak. Press, Grand Forks, p. 230, variation.

*Formica integra haemorrhoidalis*, Gregg, 1963, The ants of Colorado, Univ. Colo. Press, Boulder, p. 554, distribution, biology, variation.

? *Formica ravida*, Gregg, 1963, *op. cit.*, p. 579, distribution.

1. RELATIONSHIP OF ***HAEMORRHOIDALIS*** TO ***INTEGRA***. There seems little doubt that these two rather similar forms are closely related. At the same time, I know of no evidence indicating that they are conspecific. All of the samples of *integra* I have seen are from east of the Great Plains; all lack hairs on the frontal region and vertex, and all have the gastric pubescence rather dilute and the integumental surface here sericeous-subopaque. In *haemorrhoidalis*, on the contrary, unrubbed specimens seem always to bear at least one pair of hairs on the frontal region, and most samples have an additional pair of the vertex; the gastric pubescence is thick, opaque and grayish-

white, yielding the effect of a bluish "bloom" in fresh specimens seen without magnification. Creighton cites the Black Hills of South Dakota as the eastern limit of *haemorrhoidalis* and the western limit of *integra*, yet he does not mention intergrades from this region. Wheeler and Wheeler, on the other hand, mention finding no *integra* samples in North Dakota, while, under the present interpretation, *haemorrhoidalis* is found throughout most of that state. These apparent contradictions will have to be resolved by the study of more material from the Dakotas, but for the time being I am going to treat *haemorrhoidalis* and *integra* as the distinct species that the available evidence indicates they are.

2. SYNONYMY OF ***RAVIDA***. Creighton placed *ravida* with *obscuripes* because they shared the character, "Head of the largest workers as broad as long (mandibles excluded)," versus "Head of the largest workers longer than broad (mandibles excluded)." Unfortunately, this difference cannot be confirmed by actual measurements on relevant specimens available to me. The largest of 5 syntype workers of *ravida* in the Museum of Comparative Zoology has a head length of 1.11 mm and a head width of 1.07 mm (error of measurement = about 0.01 mm). The lectotype of *F. haemorrhoidalis* measures HL 1.10 mm by HW 1.04 mm. These measurements are made in the manner generally considered standard by modern workers, and include the clypeus in the head length. Perhaps Creighton measured in some other way. If we assume that he ignored the clypeus, and took instead the mandibular insertions as his anterior reference point, then we can arrive at head lengths equal to or less than the respective widths. But if we do measure in this way, we find that species such as *integra* and *haemorrhoidalis*, which Creighton put in the "head longer than broad" category, also have the head broader than long in the largest majors. To sum up, we can say that Creighton's head length-width character as used in his keys to *Formica* species is undefined and will not separate at least some of the species it is supposed to, including *haemorrhoidalis* and *ravida*.

Once the head width is viewed in its proper light, it becomes difficult to see how such a disparate pair of species as *obscuripes* and *ravida* could ever have been bracketed together; their sculpture, color pattern and especially their pilosity are about as different as those of *rufa* group species can get. On the other hand, no such major differences exist between the lectotype of *haemorrhoidalis* and the syntypes of *ravida*. The lectotype of *haemorrhoidalis* was deliberately chosen because it was a large major worker in good condition, and because it was from Colorado, the state Wheeler had earlier selected as the type locality. The specimen matches very well most of the samples placed under that name in the Wheeler Collection. It also matches well the types of *ravida*, except that the latter have certain workers, especially the smaller ones, more or less infuscate over head and alitrunk, and have the gastric pilosity shorter, more delicate and sparser than in Colorado *haemorrhoidalis*. The infuscation character is held in common with the geographical variant *tahoensis*, which, as Creighton has already pointed out, differs from *haemorrhoidalis* significantly only in color.

I have a series from West Yellowstone, in extreme southern Montana (E. O. Wilson leg.), that resembles the *ravida* types in color, but has somewhat longer and more numerous gastric hairs, and is in this respect transitional to Coloradan *haemorrhoidalis* and typical *tahoensis*. G. C. and J. Wheeler (*loc. cit.*) describe from North Dakota 23 separate collections, of which three "compare very closely with the types of *integra tahoensis*" and three with the types of *ravida*. The remaining 17 collections "show various combinations of those characters which appear different on the two types." Gregg (*op. cit.*, p. 556) mentions two collections in western Colorado that "appear to represent intergrades between *tahoensis* and *haemorrhoidalis*," although he also distinguishes something that he calls *ravida* on the basis of two collections from northern Colorado.

The picture emerging from these considerations is one of a single moderately variable species ranging widely in the higher Great Plains and the mountains of the West. The only evident trend in geographical variation appears to affect the color, which

is clearer red over the forebody in samples from Colorado than it is elsewhere. It may be that samples from the northern Rockies also tend to have reduced gastric pilosity, but if so, this trend is at least partially reversed in southern British Columbia. A great deal of additional material must be studied from these areas before we understand how the variation runs, but the perennially problematical name *ravida* is logically retired into synonymy at this time.

3. THE SEPARATION OF *F. HAEMORRHOIDALIS* FROM OTHER MEMBERS OF THE *RUFA* GROUP. The task of separating *haemorrhoidalis* from *integra* appears much easier at this juncture than does that of distinguishing the former from certain members of the *F. integroides* complex. At first sight, it seemed that one might modify Creighton's couplet 21 in the *rufa* group key so as to bring out *haemorrhoidalis* by its lack of "gular" hairs (more than two hairs are frequently present on the petiolar crest of *haemorrhoidalis* workers). A review of even the limited amount of material available to me, however, shows that some workers in some *haemorrhoidalis* nest series have one to as many as 6, 8 or even more delicate erect hairs on the under surface of the head, thus making transition toward *integroides*-complex forms such as *F. propinqua*, which are very similar to *haemorrhoidalis* in general appearance, and especially in sculpture and gastric pubescence, but which have more abundant and widely-distributed erect pilosity on the forebody. At present, I cannot see how all of these forms can be separated from one another, if indeed they should be. The situation will be clarified by more material, especially samples having females definitely associated with workers in unmixed nests. A large component of the confusion among these species to date is traceable to mixed series, especially incorrect associations of female with worker castes.

For the moment, it seems safe to suggest that *F. integroides subfasciata* is a straight synonym (based on a slightly faded sample) of *F. integroides*, and that *F. coloradensis* is probably a good species, as judged from its apparently correctly associated female, which has rather abundant, fine erect pilosity on the head

as well as the legs, and a more dilute representation of the same on the sparsely pubescent gastric dorsum. (Other winged females from Florissant, the *coloradensis* type locality, were originally included in the type series, but these are really ordinary hairless *haemorrhoidalis* examples.)

The form *planipilis*, placed by Creighton as a subspecies of *F. integroides*, has been linked with *coloradensis* by Creighton and by Gregg, who claim to have found intergrades between *coloradensis* and *planipilis* in Utah and Colorado. Since these two forms are only color variants so far as the literature is concerned, they may be synonymous; still, one would like to know what the female of *planipilis* is like before deciding on this relationship.

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